
[FROM THE AMERICAN JOURNAL OF SCIENCE, VOL. XLVIII, SEPT., 1894.]

DESCRIPTION OF TERTIARY ARTIODACTYLES.

By O. C. MARSH.



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THE main object of the present paper is to figure, and to describe more fully, several interesting ungulate mammals, which have been previously named and noticed by the writer. A number of others, mostly allied forms, are here described for the first time. The specimens discussed are chiefly from the western part of the country. Some of them from the Miocene, however, are apparently identical with those found on the Atlantic coast, and thus for the first time it is possible to make out a definite horizon in the Tertiary, extending nearly across the continent.

Eocene BUNODONT ARTIODACTYLES.

The Artiodactyles known from the Eocene of this country are few in number, and nearly all small generalized forms. The oldest hitherto found appear to have suilline affinities, but the others cannot be placed with any certainty in any of the existing groups. The first Artiodactyles, so far as now known, are preserved in the lower Eocene, in the horizon named by the writer the "Coryphodon beds," and these are all primitive forms. In the middle Eocene, especially in the "Dinoceras beds," the remains of these mammals are more abundant, and some of them permit accurate determination. In the upper Eocene, in the Diplacodon horizon, more specialized forms occur, and for the first time resemblance to several modern types can be recognized.

Eohyus distans, sp. nov.

The present genus was proposed by the writer in 1877, in an address before the American Association for the Advancement of Science.* In reviewing the extinct ungulates of this country, the following statement was then made in regard to the present group:—

* Introduction and Succession of Vertebrate Life in America, this Journal, vol. xiv, p. 362, 1877.

"The Artiodactyles, or even-toed Ungulates, are the most abundant of the larger mammals now living; and the group dates back at least to the lowest Eocene. Of the two well marked divisions of this order, the Bunodonts and the Selenodonts, as happily defined by Kowalevsky, the former is the older type, which must have separated from the Perissodactyle line after the latter had become differentiated from the primitive Ungulate. In the Coryphodon beds of New Mexico, occurs the oldest Artiodactyle yet found, but it is at present known only from fragmentary specimens. These remains are clearly Suilline in character, and belong to the genus *Eohyus*. In the beds above, and possibly even in the same horizon, the genus *Helohyus* is not uncommon, and several species are known."

The type specimen of the genus *Eohyus* is represented below, natural size, in figure 1. Various other remains have been found, which might be referred to this species, but they give but little definite information as to its affinities, since it is not certain that the reference is correct. The type specimen is a last upper molar, and the characters of its crown are well shown in the figure. Another upper molar shows the same essential features. Judging from these specimens alone, the animal would appear to have been a suilline, or at all events, a bunodont Artiodactyle. Future discoveries must determine its exact position. With the specimens described next below, the present remains represent a distinct family, which may be called the *Eohyidae*.

Eohyus robustus, sp. nov.

A larger species, which may be referred provisionally to the genus *Eohyus*, is represented by portions of a pair of lower jaws with imperfect teeth, and fragments of other specimens. The teeth are tubercular, and agree sufficiently well with the type of the genus to be regarded as belonging to an allied species. The lower jaws are very short and robust, with a strong symphysis. There were apparently four lower premolars and three molars, forming a continuous series, measuring about three inches in length. The depth of the jaw below the first true molar was one inch. The remains representing this species are from the lower Eocene of New Mexico.

Various remains of animals with a dentition resembling that of suillines have been described by Cope under the generic name *Periptychus*, which is preoccupied. These remains are from the so-called Puerco deposits, or lower Wahsatch of New Mexico, a horizon lower than that in which the type of *Eohyus* was discovered.

Parahyus aberrans, sp. nov.

In figure 2 below, a last upper molar tooth is represented natural size, which may be referred to the present genus, described in 1876.* There can be little doubt that the type species, as well as the present tooth, belonged to suilline mammals, although they indicate animals much larger than would be expected from so low a horizon. Moreover the type had but three lower premolars, and thus was more specialized than most of the ungulates from the same horizon.

The present specimen resembles somewhat the last upper molar of *Homacodon*, but shows distinct indications of a third posterior cone on its inner margin. This specimen was found in the Coryphodon beds of Wyoming, near the locality where the type of *Parahyus vagus* was discovered. It represents an animal about half as large as the type of the genus.

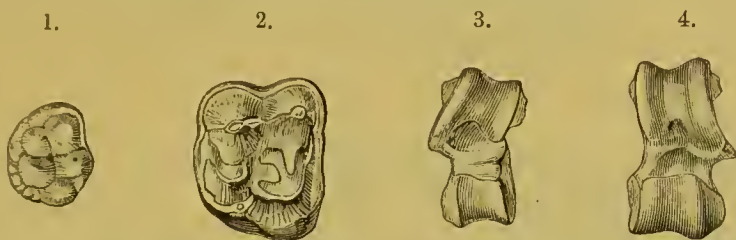


FIGURE 1.—Last upper molar of *Eohyus distans*, Marsh; seen from below.

FIGURE 2.—The same tooth of *Parahyus aberrans*, Marsh; seen from below.

FIGURE 3.—Astragalus of *Homacodon priscus*, Marsh; front view. All three figures are natural size.

FIGURE 4.—Astragalus of *Homacodon pucillus*, Marsh; front view. Twice natural size.

Homacodon priscus, sp. nov.

Among the undoubted Artiodactyles of the lower Eocene are two species which cannot at present be separated from the genus *Homacodon*. The astragalus of one of these is represented above in figure 3, and a second smaller species, *H. pucillus*, in figure 4. The other known remains of these two species are not distinctive, but indicate true Artiodactyles of the bunodont type, and are interesting mainly from proving the existence of such forms in the lower Eocene. They occur in the Coryphodon beds of Wyoming and New Mexico.

Teeth resembling those of *Helohyus* are likewise found in this horizon, but it is not certain that they pertain to true Artiodactyles. Some have been referred to the Perissodactyles. Others may belong to the *Mesodactyla*.

* This Journal, vol. xii, p. 402, November, 1876.

Homacodon vagans, 1872.

In the Dinoceras beds of the Bridger basin, in Wyoming, which may be regarded as middle Eocene, various remains of Artiodactyles have been found, but none with the selenodont dentition. All yet discovered still belong to the bunodont division of *Artiodactyla*, and most of these are small in size. The first genus discovered and described was *Homacodon*, and the type specimen is the most perfect of the group yet found.* In figures 5 and 6 below, the upper and lower molar teeth of this specimen are represented, and in figures 7 and 8, the distal end of the tibia and the astragalus of the same individual are also shown, all twice natural size.



FIGURE 5.—Upper molar series of *Homacodon vagans*, Marsh; (type) seen from below.

FIGURE 6.—Lower series of same individual; seen from above.

Both figures are twice natural size.

The present genus has apparently the complete dentition, forty-four teeth, although the type specimen does not reveal the exact number of incisors. The canines are large. The anterior premolars, above and below, are secant. The last upper premolar has a single outer cusp and one inner cone. The upper molars have each two conical external cusps. There is a small median anterior cusp, also, on each. The first molar has three posterior cusps, all well developed. The second molar has the inner posterior cusp small, and in the third molar, this is wanting, or only represented by the basal ridge from which the others were derived.

The skull of the type specimen of the present species has a brain case of fair size, and a sharp sagittal crest. The orbits are not closed behind. The cervical vertebræ are short, and have their ends oblique, indicating a curved neck. The dorsals are of moderate length, with the centra broad, and their ends flat. The posterior trunk vertebræ are all keeled below.

* This Journal, vol. iv, p. 126, August, 1872.

There appear to have been five digits in the manus, and the same number in the pes, although probably only four were functional. The animal was about the size of a small rabbit.

The present genus with the one next described represent a distinct family, which may be called the *Homacodontidae*.

After the establishment of the genus *Homacodon*, by the writer, in 1872, Cope proposed the name *Pantolestes* for a small animal from essentially the same horizon. The type was a lower jaw, with the teeth too imperfect for exact determination, but the animal was referred to the Lemuroids.* This reference was subsequently strengthened by Cope, who placed this specimen in the genus *Notharctus* of Leidy, with *Pantolestes* as a synonym.† Afterwards he revived the name *Pantolestes*, and placed under it remains of Artiodactyles, some evidently pertaining to the genus *Homacodon*, and later still he included other species, but none of them apparently distinct from that genus.

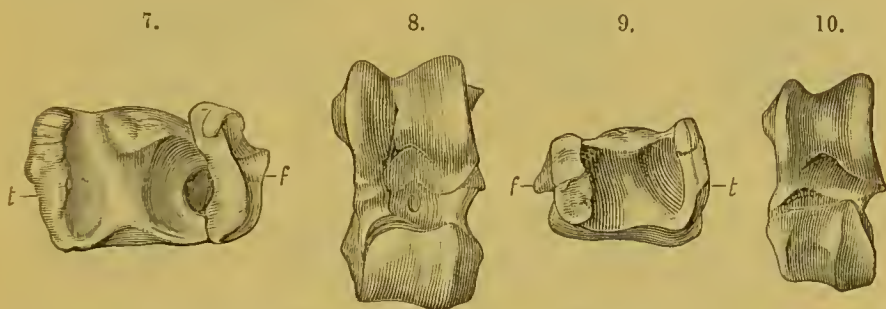


FIGURE 7.—Tibia of *Homacodon vagans*; (type) distal end. *t*, tibia; *f*, fibula.

FIGURE 8.—Astragalus of same individual; front view.

FIGURE 9.—Tibia of *Nanomeryx caudatus*, Marsh; distal end.

FIGURE 10.—Astragalus of same species; front view.

All the figures are twice natural size.

Nanomeryx caudatus, gen. et sp. nov.

This genus appears to be nearly related to *Homacodon*, with which it agrees in several respects, but may be distinguished from it by the fact that the fibula is reduced, and coössified distally with the tibia. The lower jaws are more slender and compressed than in *Homacodon*, and there is a short diastema between the canine and first lower premolar. The bones of the skeleton, even the vertebræ, are very hollow.

* Proc. Amer. Philos. Soc., vol. xii, p. 467, for 1872.

† Sixth Ann. Rep. U. S. Geol. Surv. Terr., p. 549, 1873.

The humerus is perforated above the lower condyle, and the inner condylar margin is without the process characteristic of *Homacodon*. The radius and ulna are separate, but the latter bone is quite slender. The fibula is incomplete. The lower part has coalesced entirely with the tibia, but the suture remains distinct, except in very old individuals. In figures 9 and 10, the distal end of the tibia and the astragalus of this species are represented twice natural size.

The present species is only about half as large as *Homacodon vagans*, and is thus one of the smallest Eocene Artiodactyles known. The first specimens discovered were found by the writer in 1870, near Fort Bridger, Wyoming. The type specimen here described is from the same region. All are from the Dinocerat beds of the middle Eocene.

Helohyus plicodon, 1872.*



FIGURE 11.—Last upper molar of *Helohyus plicodon*, Marsh; (type) seen from below.

FIGURE 12.—Second and third upper molars of same species.

FIGURE 13.—Three worn upper molars of same.

FIGURE 14.—Lower teeth of same.

FIGURE 15.—Last lower molar of *Helohyus* (*Thinotherium*) *validus*, Marsh; top view.

FIGURE 16.—The same tooth of *Helohyus* (*Elotherium*) *lentus*, Marsh.

All the figures are natural size.

The genus *Helohyus*, as at present known, includes several species of suilline mammals, all much larger than those of *Homacodon*, and most of them, at least, from a higher horizon of the middle Eocene. The type specimen of the present species, which is also the type of the genus, includes the last upper molar represented natural size, in figure 11 above. This is in fine preservation, and shows clearly the characteristic features of the crown. Other remains found with the type, and still others from the same locality or horizon, give more characters of the genus, although no single skeleton is known

* This Journal, vol. iv, p. 207, September, 1872.

as complete as that of *Homacodon*. Figure 12 above shows the second and third upper molars of the present species; figure 13, three upper molars of an old animal; and figure 14, the lower teeth, all natural size. The astragalus is well shown in figure 17. The upper molars resemble those of *Homacodon*, but differ in having but two posterior cones.

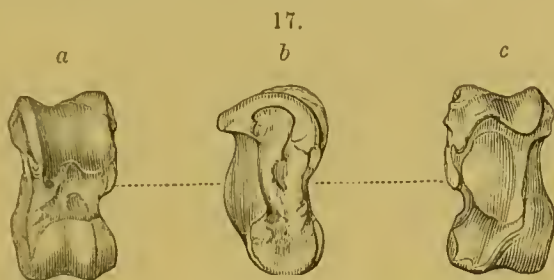


FIGURE 17.—Astragalus of *Helohyus plicodon*. Natural size. *a*, front view; *b*, side view; *c*, back view.

Two other species which probably should be referred to the present genus are *Thinotherium validum* and *Elotherium lentum*, described by the writer from specimens found in the same region as the type of *Helohyus*. The last lower molar of each is shown in figures 15 and 16. It is quite possible that another allied species was described by the writer under the name *Stenacodon rarus*, but at present the exact relationship between these forms cannot be determined. All are from the middle Eocene of Wyoming.

EOCENE SELENODONT ARTIODACTYLES.

In the autumn of 1870, the writer explored a new Tertiary lake-basin, which he had discovered south of the Uinta mountains, in Utah. This exploration was carried on with great hardship and much danger from hostile Indians, but proved conclusively that this lake-basin was of late Eocene age, and it was subsequently named by the writer, the Uinta basin. The first results of this exploration were published in an article "On the Geology of the Eastern Uinta Mountains,"* a paper that appears to have been overlooked by several recent writers on the subject. This Eocene lake-basin was quite distinct from the older Bridger basin, north of the Uinta mountains, which the writer also first explored in 1870. These researches further resulted in securing many new vertebrate fossils from each basin. The two were later distinguished by the writer, by names taken from the largest and most characteristic animals found in them. The strata of the Uinta basin were thus named the "Diplacodon beds," and those of the northern lake deposits, the "Dinoceas beds."

* This Journal, vol. i, p. 191, March, 1871.

Eomeryx pumilus, Marsh.

Among the interesting fossils found by the writer in the Uinta basin, in 1870, were remains of three small Artiodactyles, each with selenodont dentition, the earliest then known in the country. One of these animals was described under the name *Agriochærus pumilus*,* as the lower teeth and other portions secured resembled strongly the corresponding parts pertaining to that genus, as known from a higher horizon. Subsequent discoveries proved that these remains were distinct from those of *Agriochærus*, the upper molars resembling more nearly those of *Ancodus* (*Hyopotamus*), but in reality representing a new genus, which was named by the writer *Eomeryx*, in the address already cited.†

18.



FIGURE 18. — Upper teeth of *Eomeryx pumilus*, Marsh; seen from below. Natural size.

In the address quoted, the writer defined the Uinta Artiodactyles with selenodont dentition, as follows: "In the *Diplacodon* horizon of the upper Eocene, the Selenodont dentition is no longer doubtful, as it is seen in most of the *Artiodactyla* yet found in these beds. These animals are all small, and belong to at least three distinct genera. One of these, *Eomeryx*, closely resembles *Homacodon* in most of its skeleton, and has four toes, but its teeth show well marked resemblances, and a partial transition to the teeth of *Hyopotamus*, from the Eocene of Europe. With this genus, is another (*Parameryx*), also closely allied to *Homacodon*, but apparently a straggler from the true line, as it has but three toes behind. The most pronounced Selenodont in the upper Eocene is the *Oromeryx*, which genus appears to be allied to the existing Deer family, or *Cervidae*, and if so is the oldest known representative of the group. These facts are important, as it has been supposed, until very recently, that our Eocene contained no even-hoofed mammals." Again in speaking of the Oreodonts in the Mioocene, the following statement is made: "The least specialized, and apparently the oldest, genus of this group is *Agriochærus*, which so nearly resembles the older *Hyopotamus*, and the still more ancient *Eomeryx*, that we can hardly doubt that they all belonged to the same ancestral line."

* This Journal, vol. ix. p. 250, March, 1875.

† *Ibid.*, vol. xiv, p. 364, November, 1877.

By subsequent researches in the Uinta basin, the writer secured many additional remains of all these three Artiodactyles, and in regard to *Eomeryx*, at least, nearly all the important characters can thus be determined. These specimens confirm in a decisive manner the original determination of the essential features and affinities of the animal described from the first fragmentary remains.

The skull of *Eomeryx* has the same general form as that of *Agriochærus*, and the lower jaw and dentition are essentially the same. As in that genus, there is no lacrymal fossa, and the orbit is not closed behind. The complete dentition of forty-four teeth is a primitive character to be expected from a horizon lower than that of *Agriochærus*. In this respect and in several others, especially in the feet, *Eomeryx* shows a nearer relationship to *Oreodon*, with which it certainly has strong affinities.

The upper molars, as shown above, natural size, in figure 18, have the characteristic fifth lobe on the front of the crown, as in the *Ancodontidæ*, or *Hyopotamus* family, and this feature alone, given in the original description of the genus, served to distinguish *Eomeryx* from any allied forms in the strata in which it was found. The lower molars are shown in figure 22.

19.



FIGURE 19.—Upper teeth of *Hyomeryx breviceps*, Marsh; seen from below. Natural size.

The limbs and feet of *Eomeryx* are of much interest. The radius and ulna are distinct, and of nearly equal size. There are four functional digits in the manus, and the first was also represented, although of little use. In the hind limbs, the fibula was slender, but complete. There were four functional toes in the pes, all well developed, and a remnant, at least, of the first was present. The digits were terminated by narrow hoofs, similar to those in *Oreodon*.

The genus *Eomeryx*, as thus determined, clearly represents a distinct family, which may be called the *Eomeriidae*. This group includes the genus *Hyomeryx*, described below, and contains the oldest selenodont suillines in this country. It had for its predecessors *Helohyus* and *Homacodon* from the strata of the Dinoceras beds.

The present genus and species, *Eomeryx pumilus*, were redescribed by Scott and Osborn, in 1887, under the name *Protoreodon parvus* (Proc. Amer. Philos. Soc., vol. xxiv, p. 257), and later, in 1889, by Scott, more in detail (Trans. Amer. Philos. Soc., vol. xvi, p. 487). No reference was made in either paper to the article by the writer, cited above, relating to the Uinta basin, and the statements made concerning the first researches in the basin are inaccurate. The description and figures are in the main correct.

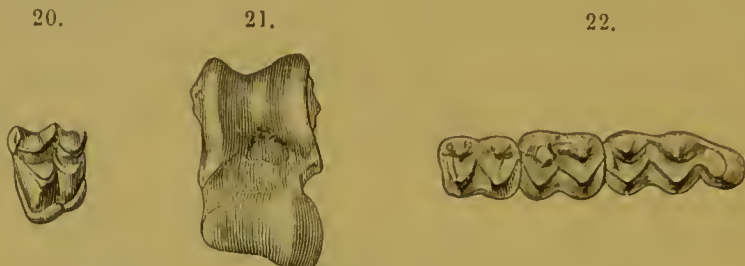


FIGURE 20.—Upper molar of *Parameryx laevis*, Marsh; seen from below.

FIGURE 21.—Astragalus of same species; front view

FIGURE 22.—Lower molars of *Eomeryx* (*Agriochærus*) *pumilus*; top view.

The figures are all natural size.

Hyomeryx breviceps, gen. et sp. nov.

The present genus is nearly allied to *Eomeryx*, but represents a more specialized form. The skull is shorter, particularly in the facial region, but the most important difference is seen in the premaxillaries. In the present type, these are very much reduced, and thoroughly coössified with the maxillaries. They cover the canines in front, but contain no incisors. The upper canines are smaller than those of *Eomeryx*, and the maxillaries containing them are less robust. There is a diastema behind the upper canine, and the molars agree in form with those of *Eomeryx*. The lower jaws have the full dentition, the first premolar being caniniform, as in *Eomeryx* and *Oreodon*, but the lower jaws are less massive than in those genera, especially in front. Figure 19 shows the upper teeth of the type specimen.

There appear to be four functional digits in the fore feet, and the first is probably represented in a much reduced form. In the hind feet, also, there are four functional digits, and a remnant of the fifth is still retained.

The type specimen of the present genus is from nearly the same horizon as the type of *Eomeryx*. The present species was about two-thirds the size of *Eomeryx pumilus*.

Parameryx levis, sp. nov.

The second genus of selenodont ungulates referred to in the address quoted is quite distinct from *Eomeryx*, but is known from less perfect remains. It may readily be distinguished from that genus by the upper molars that lack the extra fifth cone, and by the slender, compressed lower jaws, without a caniniform first premolar. The limbs and feet, also, show important differences. In the hind feet, there were but two functional digits, although the second was present in a reduced form. An upper molar and the astragalus of this species are shown in figures 20 and 21.

In size, the present species was smaller than the type of *Eomeryx*, and of more slender proportions. There appear to be one or two species of the present genus besides the type. One of these may be distinguished by the lower jaws, which have a deep groove on the inner face of the ramus, extending forward nearly to the symphysis. This form may be known as *Parameryx sulcatus*.

In the address already quoted, this genus was regarded as possibly related to the Camels and Llamas, but until additional remains are found, its exact affinities must remain in doubt.

In the two publications above cited, Scott and Osborn have given the name *Leptotragulus* to certain Artiodactyle remains from the Uinta deposits, but it does not appear from the descriptions or figures, that the specimens described are distinct from those on which the genus *Parameryx* was established. Some of them are apparently identical, although the species may be different. Others may pertain to *Oromeryx*, a genus certainly distinct from *Leptotragulus*, as described.

Oromeryx plicatus, sp. nov.

23.



FIGURE 23.—Upper teeth of *Oromeryx plicatus*, Marsh; seen from below. Natural size.

The third genus of Artiodactyles with selenodont dentition found in the Uinta basin by the writer, and noticed in the address above quoted, is *Oromeryx*. This genus is represented by numerous remains, many of them in good condition, which afford characters for distinguishing it from those above described. They represent, moreover, animals somewhat smaller in size than those already noticed, and of proportions still more delicate.

The skull in the frontal region is broad and flat. The supra-orbital foramina are widely separated, with diverging grooves leading to them from the nasal suture. The upper molars have oblique crowns, with no antero-median cusp. The upper molar teeth are especially characteristic, as seen from those represented natural size, in figure 23 above. The enamel of the crowns is finely wrinkled, and this has suggested the specific name. This feature is seen also in the lower molars, especially in the teeth of animals not fully adult. The lower jaws are slender, and compressed in front, and there is no diastema in the dentition.

The bones of the skeleton are very hollow. The humerus is perforated above the distal condyle. The ulna is complete. The fibula is also complete, with the distal end much compressed. There are four functional digits in the manus, and possibly five. There are four usable digits, also, in the hind feet, with the lateral ones well developed.

The affinities of this genus, as already stated, appear to be with the Deer family, and it also has some points of resemblance to the Traguloids.

MIocene ARTIODACTYLES.



FIGURE 24.—Upper teeth of *Agriomeryx migrans*, Marsh; seen from below. Two-thirds natural size.

Agriomeryx migrans, gen. et sp. nov.

The present genus is most nearly related to *Agriochærus*, Leidy, and appears to be its direct successor in a higher horizon of the Miocene. The two genera may be readily distinguished by the teeth. The older form has four premolars above and below, while *Agriomeryx* has but three. In figure 24 above, the left upper dental series of this species is shown two-thirds natural size. There are no upper incisors in the present genus. The lower jaws contain a full series of teeth,

twenty-two in number. The first lower premolar has assumed the form and function of a canine, the true lower canine being quite small, and resembling the incisors. The type specimen figured is from the *Protoceras* horizon in South Dakota.

Thinohyus, 1875.*

25.



26.



27.

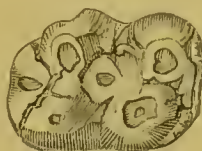


FIGURE 25.—Last upper molars of *Thinohyus socialis*, Marsh; seen from below.

FIGURE 26.—Last upper molar of *Thinohyus lentus*, Marsh.

FIGURE 27.—Second lower molar of *Thinohyus antiquus*, Marsh; top view.

All the figures are natural size.

28.



FIGURE 28.—Lower teeth of *Thinohyus nanus*, Marsh; top view. Natural size.

Thinohyus nanus, sp. nov.

The present species is the smallest of the genus yet discovered. The specimen selected as the type is represented in figure 28 above, natural size. It is a left lower jaw, with the third and fourth premolars and the three molars in place. The front of the jaw is not preserved, but the alveole of a large canine is present, and also those of the first and second premolars, which were evidently secant. There was apparently no diastema behind the canine, and the whole jaw was unusually short and robust. The type specimen is from the Miocene of South Dakota, but the exact horizon is not known.

Two other species of the present genus, from the Miocene of Oregon, have already been described by the writer, and in figures 25 and 26 typical specimens of both are shown. The largest species is *Thinohyus* (*Dicotyles*) *antiquus*, from the same horizon in New Jersey, and the type is shown in figure 27.

Leptochærus gracilis, sp. nov.

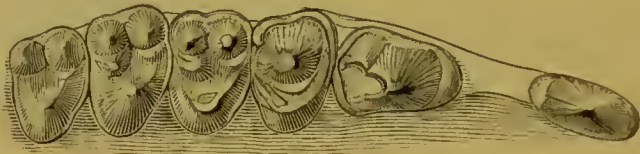
The genus *Leptochærus* was established by Leidy in 1856, the type specimen being the fragment of a small lower jaw containing two molar teeth, supposed to pertain to a suilline mammal.† Other remains subsequently referred to the same genus threw no additional light on the affinities of the animal, which up to the present time have remained in doubt.

* This Journal, vol. ix, p. 248, March, 1875.

† Proc. Acad. Nat. Sci. Phila., p. 88, 1856.

A specimen in the Yale Museum representing a different species, apparently pertains to the same genus, and proves, moreover, that the original suggestion as to the nature of the animal was probably correct. This specimen is in fine preservation, and consists of the skull and greater portion of the skeleton of an adult individual about as large as a rabbit. One interesting feature of the skull is the comparatively large size of the brain cavity, and the cast it contains shows well-marked convolutions. The dentition is of special interest. The upper molars resemble those of *Helohyus*, especially the last molar of that genus. They have each two outer cones, a single large inner cusp, and two intermediate lobes, the anterior uniting by wear with the inner cusp so as to form a crest. The fourth premolar has a single outer cone and one inner cusp. The third premolar is very large, and subtriangular in outline. The second premolar is secant, and behind it is a well-marked diastema. The teeth are shown in figures 29 and 30 below.

29.



30.

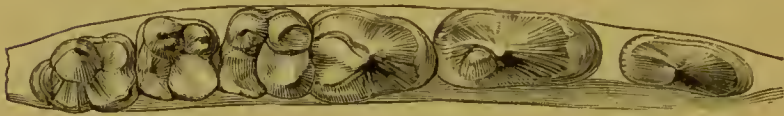


FIGURE 29.—Upper teeth of *Leptochaerus gracilis*, Marsh; seen from below.
FIGURE 30.—Lower teeth of the same skull; top view.

Both figures are twice natural size.

The lower jaws in the present species are slender, especially in front. The lower molars are very small, decreasing in size to the last. The fourth premolar is larger than the first molar. The anterior premolars are secant, and there is a diastema in front and behind the second. There is a deep groove on the inner side of the lower jaw, extending from the dental foramen nearly to the symphysis.

The radius and ulna are separate, and the latter well developed. There were apparently four functional digits in the manus. The fibula is much reduced. Its lower portion has coalesced with the tibia. The hind foot resembles that of *Homacodon*, having four usable digits, but the navicular and cuboid are eoössified, an unexpected feature.

These remains prove that the animal they represent belonged to a distinct family, which may be called the *Leptocheridae*. The type specimen of the present species is from the Miocene of South Dakota.

Calops cristatus, 1894.

The peculiar Artiodactyle described under the above name, in a late number of this Journal (p. 94), had many features of interest besides those mentioned in the original description. Some of these are as follows:

The brain was comparatively well developed, and an unusually large part of the cerebral lobes was covered by the parietals. The frontal region of the skull between the orbits was more or less concave. The antorbital depressions extend well forward. There is a diastema between the upper canine and the first premolar, and between the first and second premolars. The canines above and below are small. The first lower premolar appears to be wanting. The second and third premolars have secant crowns, much elongated fore and aft. The postglenoid process is quite small, but the paroccipital is large and robust. The lower jaw has a very short coronoid process, and the condyle is sessile. The angle of the jaw is well rounded and somewhat dependent.

PLIOCENE ARTIODACTYLES.

31.

32.



FIGURE 31.—First and second lower molars of *Platygonus rex*, Marsh; top view.

FIGURE 32.—Last lower molar of same species; young tooth; top view.

Both figures are natural size.

Platygonus rex, sp. nov.

The present species is the largest of the genus yet discovered. The type specimen is represented natural size, in figure 31 above. In figure 32, a last lower molar of the same species is shown, but it is a young tooth which had not yet come into wear. The peculiarity of these molar teeth, aside from their size, is that the crowns are mainly composed of well-rounded, conical tubercles, few in number, and placed systematically. The crowns of the first and second molars are each composed of four large cones, nearly equal in size, and the last molar has five.

This simplicity of structure is characteristic of the Eocene suillines, as already shown in the present article. In lower Miocene forms, it is less distinct. The type specimen of the present species and other remains were obtained by the writer, in 1871, from the Pliocene deposits of eastern Oregon.

Procamelus altus, sp. nov.

In the same horizon in eastern Oregon in which is found the peccary last described, remains of a very large extinct camel also occur. Various portions of the skull and skeleton were secured by the writer, and these all appear to pertain to the genus *Procamelus*, as described by Leidy. These remains indicate a camel exceeding in size any previously described from this country, and one in which the extremities were especially elongated. In figures 33 and 34 below, the calcaneum of this animal is represented one-fourth natural size. The known remains of this species are from the Pliocene deposits, near the John Day River, in Oregon.

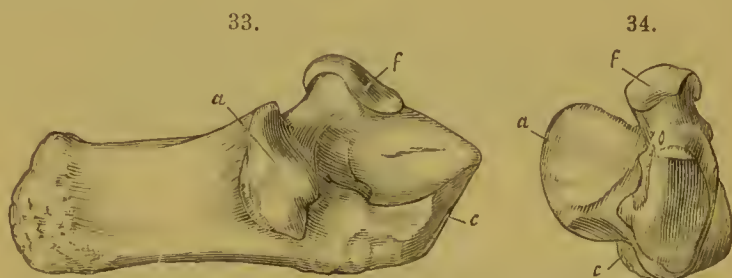


FIGURE 33.—Left calcaneum of *Procamelus altus*, Marsh; inner view.

FIGURE 34.—The same bone; front view. Both figures are one-fourth natural size. *a*, face for astragalus; *c*, face for cuboid; *f*, face for fibula.

CORRELATION OF MIOCENE HORIZONS.

In the July number of this Journal, the writer made the announcement that the horizon in the Miocene deposits of Oregon, which he had explored many years since, and named the Miohippus beds, was also represented east of the Rocky Mountains, and in the same relative position, various vertebrate fossils being common to both. In a previous number of the Journal (November, 1893), the writer had stated that a distinct horizon in the Miocene on the Atlantic coast, named by him the Ammodon beds, corresponded to one in the Rocky mountain region, in which the same genus, *Ammodon*, had been found. More recent researches have brought out the interesting fact that this horizon is essentially the same as the Miohippus beds of the central region, and as those on the Pacific coast as well, so that at last a definite horizon is determined in the Miocene, extending across the continent.

Yale University Museum, New Haven, Conn., August 15, 1894.